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THE 1939 OLSMOBILE

Automatic Safety Transmission *

By J. J. Dobbs, General Service Manager, Oldsmobile Division
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The Oldsmobile automatic safety transmission is available as optional equipment at extra cost on all 1939 models.

The unit consists of:

1—Manual Shift Lever and Controls
2—Head Gear Set
3—Front Planetary Unit, Brake Band and Servo
4—Rear Planetary Unit, Brake Band and Servo
5—Rear Unit Accumulator
6—Oil Pump
7—Oil Control Unit
8—Governor and Linkage

Manual Shift Lever

A manual shift lever is located immediately below the steering wheel and is directly connected to the transmission through a suitable linkage. This provides a convenient means for the driver to make manual shifts from neutral to low or reverse, or low range to high range.

Head Gear Set

The head gear set includes a clutch gear, sliding gear, countershaft and reverse speed idler gear. By means of the hand shift lever, the sliding gear can be made to mesh with the clutch gear and thus provide a direct coupling with the planetary units and main shaft for forward movement of the car. The sliding gear can also be made to mesh with the reverse idler gear for reverse movement of the car.

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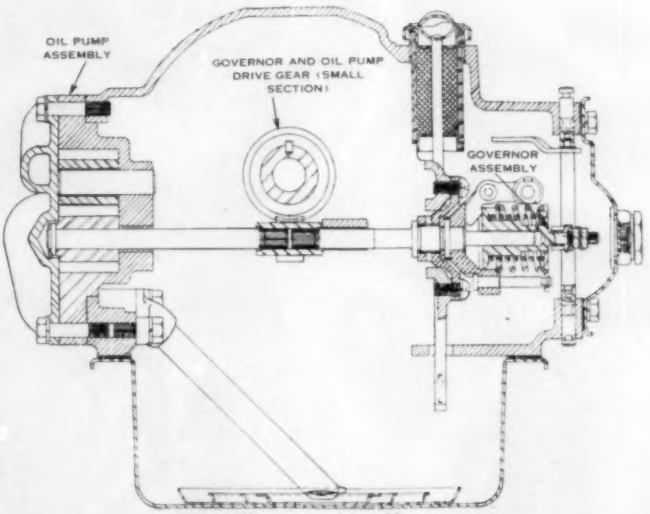
Front Planetary and Servo

The front planetary unit functions as a speed reduction unit when the brake band is applied to the planetary drum to prevent its rotation. The front planetary unit then becomes a 1.42:1 speed reducing unit.

When the front planetary unit is not functioning as a speed reducing unit, it furnishes a direct coupling through an oil pressure controlled, multiple disc clutch to the rear planetary unit. The oil to the clutch is supplied by an oil pump within the transmission.

A front servo unit is located immediately below the front planetary unit. The purpose of the servo unit is to tighten the brake band around the front planetary drum. The brake band is applied by heavy springs located inside the servo and is released by oil pressure applied to the servo piston.



Governor Assembly

Rear Planetary and Servo

The rear planetary unit functions in a manner comparable to the front unit; however, the speed reduction through the rear unit, when locked, is 2.23:1. Because of the greater reduction, the rear planetary unit is larger than the front planetary unit.

When the rear planetary unit is not functioning as a reducing unit, the planetary bands are released and the clutch plates locked by oil pressure the same as on the front unit.

In the first gear, both front and rear planetary units are acting as speed reducing units. In second gear, the rear unit functions as a speed reducing gear while the front unit is in direct drive. In third gear, the front unit functions as a speed reducing gear while the rear unit is in direct drive. In fourth gear, both front and rear units are locked (direct drive). In reverse, the units are as indicated for first gear.

Rear Unit Accumulator

The accumulator assembly is assembled to the rear servo. The addition of the accumulator is accompanied by the addition of a one-way ball check inside the oil control unit valve body. The check valve affects only the compensator system.

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When the downshift from third to first gear occurs, the oil in the compensator system is trapped by the ball check valve while the oil in the clutch system is allowed to exhaust freely. The pressure of the oil (approximately 100 lb.) in the compensator system is then sufficient to allow gradual engagement of the rear brake band on the brake drum until the rear unit clutch is disengaged. In order to limit the build-up of pressure, the oil which is trapped in the compensator piston is exhausted through the accumulator bleed slot at the moment that the pressure builds up to approximately 100 lbs. In case the accelerator pedal is depressed during the time that the downshift from third to first gear is occurring, the oil is exhausted through the throttle control valve. The rear unit accumulator functions only on the downshift from third to first gear.

Oil Pump

The oil pump, located inside the transmission, performs the dual purpose of supplying lubrication to the various points within the transmission and supply oil pressure to the planetary units and servos.

The oil pump is single geared, being driven by a single spiral drive gear that operates off a bronze gear which is shrunk on the stem of the front unit drive gear.

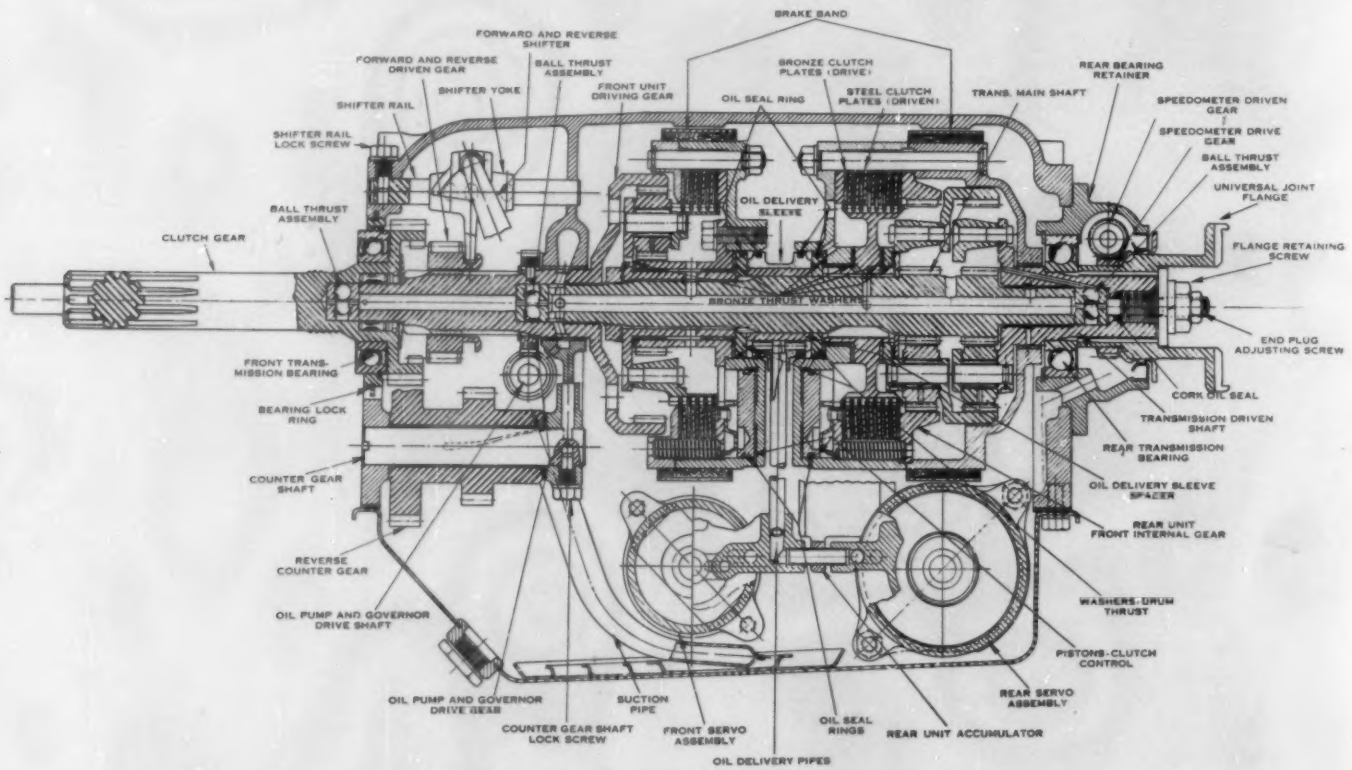
The oil pump is independent of engine operation, producing pressure only when the rear wheels are turning.

Oil Control Unit

The discharge from the oil pump first flows to the pressure regulator valve and then to the oil control unit and the lubrication system.

Distribution of hydraulic (oil) pressure to the different points of the transmission, as the changing shift conditions demand, is controlled by three oil valves incorporated in a single valve body.

The first valve is known as the rear unit or manually controlled valve, and affects



Oldsmobile 1939 Automatic Transmission Assembly

the operation of the rear planetary and servo unit only. The operation of this valve is controlled by the position of the hand shift lever to which it is directly connected.

The second valve, known as the front unit or automatic valve, is controlled by the governor. The governor in turn, operates directly off a bronze gear shrunk into the stem of the front unit drive gear. Speed of the rear wheels, except as noted below, determines whether the valve will be open or closed to the flow of oil. This valve affects the operation of the front planetary unit and servo only.

NOTE: Up to approximately 58 m.p.h. (lockout of throttle), the effect of the governor upon this valve, tending to upshift the transmission from third to fourth gear, can be overcome by depressing the foot accelerator. Above 70 m.p.h., the governor controls this valve regardless of the position of the accelerator pedal.

A third valve, known as the throttle valve, is controlled by the throttle position only. This valve affects the operation of both the front and rear planetary units. This valve does not cause any actual shifting, its only function being to bring about smooth shifts at various throttle positions, by proper metering of oil pressure to the clutch, depending on engine torque the clutch must carry.

Governor

Within the transmission is a three stage flyball governor, which affects the operation of the front planetary unit only. The automatic upshift and downshifts at part throttle occur within the first stage travel. With wide open throttle, the 3rd to 4th forced shift (approximately 58 m.p.h.) occurs within the 3rd stage of travel. This governor is driven by the same gear on the front unit driving gear which drives the oil pump. The governor alone controls the automatic upshifts from first to second gear and third to fourth gear and the automatic downshifts from second to first gear and fourth to third gear.

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Transmission Lubrication

Capacity of transmission is 3 qt. (6 pt.) when the oil pan is drained by removing oil drain plug only (as for seasonal changes), 3½ qt. (7 pt.) when oil pan is removed and the transmission is again replenished.

To fill and drain the transmission lubricant, proceed as follows: Raise rear edge of the front compartment floor covering on left side of the body. Remove the exposed small sheet metal cover. The level stick can now be reached and removed. The oil level should reach "FULL" mark on the stick. When checking the oil level, first remove the oil level stick and wipe off all oil. Insert the oil stick to check level and again remove, holding slightly to one side of the opening until the stick is all the way out. The oil level should register correctly on the measuring stick. Additional oil can be added to the transmission through the opening from which the oil level stick was removed.

The oil pan can be drained by removing the drain plug, located at front end of oil pan. The oil pan should be removed at the end of the first 5,000 miles, thoroughly washed and replenished with new oil of recommended specifications.

Thereafter, the oil pan should be removed and cleaned, and new oil added to the transmission at 10,000-mile intervals.

Lubricant Recommendations

The recommendations covering grade of oil to be used in the automatic transmission are as follows:

For Summer, use SAE 30 Engine Oil
Winter (Below 45 F.) use No. 20W
Winter (Below 0 F.) use No. 10W

It is important to use oil in the transmission which is procured and sold by reputable oil companies only.

AS A SAFETY PRECAUTION THE OIL LEVEL SHOULD BE CHECKED EVERY 1,000 MILES.

Flushing the Automatic Transmission

The oil not only should be changed at

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Technical Data

AN OUTLINE OF RESEARCH DEVELOPMENT IN GEAR LUBRICATION TESTING

By C. F. PRUTTON and A. O. WILLEY
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(Continued from June issue)

As the load intensity increases a point is reached where the loads on the hypoid drives being tested are equivalent to normal present-day loads. With a further increase in intensity the next important point is the maximum loads that could possibly be expected under present designs. And, finally, with a still further increase in intensity the maximum possible future loads that could reasonably be expected of any lubricant and the rear axle in combination are reached. Obviously, this is some point below the total load at which mechanical parts would be deformed.

In order to find the performance of a particular lubricant for each one of the three signal points listed above, series of tests was conducted known as tests A, B, and C, for each of the above indicated sets of conditions. The C test was the most severe one in the matter of loading. Because the realm of hypoid lubrication was scarcely as well explored as the lubrication of other types of gear drives, it was necessary to control the test conditions so that the results would be definitely conclusive. For these purposes, a test designed to wear out rear axles and lubricants by increased uniform loadings was used, as well as another test designed to wear out lubricants and rear axles by means of shock loads of considerable intensity. The uniform loading set-up consists of a dynamometer at the left rear driving the axle and a coupling is interposed between the left-hand rear axle and the right-hand rear axle, which in turn drives the dynamometer on the right against a resistance load. Obviously under this method while the driving face of the hypoid in the left axle is being loaded and tested, so also is the coast face of the right-hand axle being tested at the same time. Then by making the right hand dynamometer do the driving and by loading the left-hand dynamometer, the driving conditions on the faces of the gears are reversed. Thus, both drive and coast side of the gears can be alternately tested on a single assembly and one test set-up. Increments in loading were accomplished by means of increments in the resistance of the driven dynamometer. Further refinements were possible by jacketing the rear axle housings so that test could be conducted at constant rear axle temperatures by means of a circulating water system thermostatically controlled. On other tests the water-jacketed housings were replaced by the standard housings and temperatures were allowed to find their own levels. A simple removal of the inspection plate on any housing made it possible to instantly check ring and pinion gear clearances at any particular stage. This type of test has been run extensively on a large number of both Chevrolet and Packard "120" axles. Temperature recording charts and a final inspection of the pinion and ring gears on removal have shown a remarkable degree of reproducibility. Tests were conducted at normal and maximum road temperatures and at speeds which lie well within the range of those obtained in ordinary passenger car service.

Three primary groups of tests were set up as a target. These were as follows:

Test group No. 1—normal temperatures, high continuous load, and moderate speed.

Test group No. 2—high temperatures, moderate load, and moderate speed.

Test group No. 3—normal temperatures, very high load, and low speed.

In order that the final grouping of the tests should have some common denominator which would facilitate comparison a pure mineral oil was run through a series of each of the tests under each of the conditions outlined and used as a base for making comparisons with the other lubricants. Interesting as the results of these tests were, it was decided that no series of tests would be complete unless they duplicated the shock conditions developed in actual service and with which all automotive engineers are thoroughly familiar.

Shock tests conducted on a proving ground are subject to several very obviously varying characteristics. It was found desirable to build a shock test device which would enable the reproduction of shock loads of identical intensity so that the results could be properly compared. The front wheels were held firmly to the floor through a bolting down arrangement with a sheet iron strap over the top of the front tires. The center of the rear axle was positioned above the center of the shock loading device. This latter consisted of five freight car wheels hung in ball bearings. As the drive on the car was speeded up from zero to the particular miles per hour rating then being tested, the drive of the tires to the freight car wheels was transmitted only through the rubber of the tires. When the speed had been maintained for a sufficient

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period of time to establish equilibrium, the car was declutched (from a position on the test floor) and allowed to coast until a lower speed had been obtained. At this lower speed the clutch was then engaged by a trip device insuring instantaneous action and the momentum of the freight car wheels was allowed to produce a shock of considerable intensity on the driving mechanism. Obviously the rear end of the car had to be fastened with cables so that the tires could be held down to their work.

While the test procedure has been described somewhat sketchily here, it will serve to indicate the manner in which the tests were conducted. Obviously a very carefully worked out laboratory procedure had to be followed in order that true comparisons might be arrived at. Upon dissembly of the rear axle at the completion of each test, gear tooth surfaces were minutely examined and rated according to a definite plan.

This plan set up three ratings for the gear teeth which were respectively, "score", "no score", and "borderline".

A general summary of the results achieved made it possible to take any of the lubricants used and reproduce the results. We were particularly interested in delving into the future by conducting these tests at a series of intensities considerably beyond the present requirements of modern cars. As a result the cost of the research has definitely been justified in pointing the way to build better lubricants against the day when designers will choose to still further increase the accuracy of their machine work and to narrow clearances to even closer limits.

Three conclusions are possible from this series of tests.

1—Results indicate deficiencies in some commercial lubricants under certain of the extreme conditions employed.

2—But, of the commercial lubricants studied, all those which passed the laboratory shock test for hypoid lubrication are quite satisfactory under practically all other test conditions where normal temperatures are used.

3—The complete performance of lubricants in service gear tests seems to bear but a very slight relation to film strength data alone, as obtained on laboratory test machines. For example, some lubricants with an admittedly low film strength were satisfactory in all of the tests and on the other hand other equally low film strength lubricants failed in all tests.

Those who may be further interested in a more complete and detailed report of this test work are referred to an article in the Journal of the Society of Automotive Engineers, "Testing of Hypoid Lubricants", published in the August 1938 issue.

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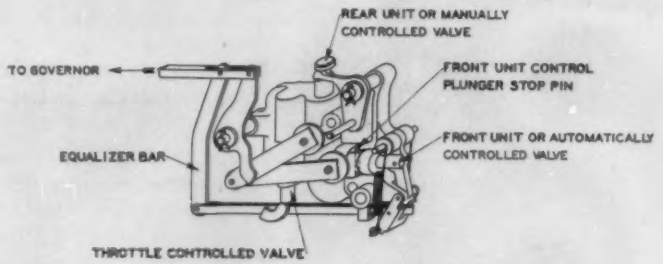
the end of the first 5,000 miles and every 10,000 miles thereafter, but the transmission should be flushed (cleaned) out with flushing oil at these same mileage intervals.


REAR UNIT OR MANUALLY CONTROLLED VALVE
TO GOVERNOR
FRONT UNIT CONTROL PLUNGER STOP PIN
FRONT UNIT OR AUTOMATICALLY CONTROLLED VALVE
EQUALIZER BAR
THROTTLE CONTROLLED VALVE

Oil Control Unit Showing Three Valves

Automatic Transmission Flushing Instructions

1—Remove oil pan drain plug and drain all oil from transmission. It is preferable that the oil in the transmission be hot while draining as a more thorough job can then be accomplished.

2—Reinstall oil pan drain plug.

3—Remove, empty and clean oil pan and then reinstall on transmission.

4—Jack up car so that rear wheels are free to turn.

5—Add 3 qt. (6 pt.) of 10W engine (flushing) oil to the transmission.

6—Start the engine and operate the car in low range (1st or 2nd gear) for approximately five minutes. This will permit flushing oil to become hot and, therefore, more effective.

7—Shift transmission from low range (1st gear to 2nd gear), and then up through 3rd and 4th gear, allowing the transmission to remain in each of the gears about three minutes.

8—Drain flushing oil; remove, empty, and clean the oil pan.

9—Reinstall oil pan, using new oil pan gasket.

10—Lower car to floor.

11—Refill transmission with 3½ qt. (7 pt.) of engine oil of recommended grade and viscosity.

Towing

The following instructions cover the towing (or pushing) of cars equipped with the automatic transmission.

1—To start the engine, turn the ignition key on, disengage the clutch, step on the starter, and move the manual shift lever to the high range position. When the car moves faster than 10 miles per hour, engage the clutch. The car will now move forward in 3rd gear, and into 4th gear automatically when a speed of 21-22 miles per hour is reached.

2—To tow or push car to service station, or any distance because of a dead engine, etc., move manual shift lever to neutral position. Clutch pedal can be left engaged and ignition key off.

3—If transmission will operate ONLY in 1st gear and car must be towed to a service station, either raise the rear wheels free of the ground and tow the car with the rear end raised, or tow the car with the propeller shaft disconnected at the differential end. The unattached end of the propeller shaft should, of course, be securely fastened to the chassis to prevent it from dragging or catching onto some object on the ground.

EDITOR'S NOTE: The above instructions covering flushing and draining of the unit, and replenishing or refilling with the proper SAE grade of engine oil, should be followed exactly. These are the only services that should be attempted by the service station. Adjustments of the various parts within the transmission should be made by an authorized Oldsmobile dealer's service station.